

CLAIMS

What is claimed is:

1. A module having inductor-free circuitry for controlling voltage imbalances between a pair of capacitors connected in a series arrangement,
5 comprising:

a first terminal configured for connection to a positive plate of the first capacitor;

a second terminal configured for connection to a negative plate of the first capacitor and to a positive plate of the second capacitor;

10 a third terminal configured for connection to a negative plate of the second capacitor; and

an active element integrated within the inductor-free circuitry between the first, second, and third terminals and adapted to substantially balance the voltage imbalances between the pair of capacitors, the active element having power
15 connections to the first and third terminals.

2. The module of claim 1, wherein the active element is an op amp, the op amp having an input, an output, and a feedback loop, the input being connected to two voltage dividing resistors.

3. The module of claim 2, wherein the output is connected to the second
20 terminal.

4. The module of claim 3, wherein the output is connected to the second terminal through a current limiting resistor.

5. The module of claim 2, wherein the feedback loop includes a feedback resistor.

6. The module of claim 1, wherein the active element is a switched voltage converter.

7. The module of claim 6, wherein the switched voltage converter incorporates a flying capacitor.

5 8. The module of claim 1, wherein at least one of the terminals is further configured for connection to a second module having inductor-free circuitry for controlling voltage imbalances between a second pair of capacitors connected in the series arrangement.

10 9. The module of claim 8, wherein the first and second modules' inductor-free circuitries are substantially identical.

10. The module of claim 8 wherein the first and second modules' circuitry overlap upon connection to the second module.

11. The module of claim 10, wherein the first and second module's circuitry overlap at one of the terminals.

15 12. The module of claim 10, wherein the first and second modules' circuitry overlap across a common capacitor shared by the two pairs of capacitors.

13. A capacitor device package, comprising:

a plurality of capacitors electrically connected in a series arrangement; and

20 a module having inductor-free circuitry for controlling voltage imbalances between a pair of capacitors connected in the series arrangement, comprising:

a first terminal configured for connection to a positive plate of the first capacitor;

a second terminal configured for connection to a negative plate of the first capacitor and to a positive plate of the second capacitor;

a third terminal configured for connection to a negative plate of the second capacitor; and

an active element integrated within the inductor-free circuitry between the first, second, and third terminals and adapted to substantially balance the voltage imbalances between the pair of capacitors, the active element having power connections to the first and third terminals.

14. The capacitor device package of claim 13, wherein the plurality of capacitors is mounted on a motherboard having electrical connections for connecting the plurality of capacitors, the module, and external connections with each other.

15. The capacitor device package of claim 14, wherein the module is mounted on a daughter board, the daughter board being mounted on the motherboard.

16. The capacitor device package of claim 13, wherein the plurality of capacitors is connected to external leads in a flex circuit construction.

17. The capacitor device package of claim 16, wherein the module is mounted across the external leads, the module also having a flex circuit construction.

18. The capacitor device package of claim 14, wherein a substrate is positioned above the module, the plurality of capacitors, and the motherboard.

19. The capacitor device package of claim 18, wherein portions of the substrate, motherboard, module, and plurality of capacitors are encapsulated in molding material.

20 A method for controlling voltage imbalances between a pair of capacitors connected in a series arrangement, comprising:

forming a first terminal configured for connection to a positive plate of the first capacitor;

forming a second terminal configured for connection to a negative plate of the first capacitor and to a positive plate of the second capacitor;

forming a third terminal configured for connection to a negative plate of the second capacitor; and

integrating an active element within an inductor-free circuitry between the first, second, and third terminals such that the active element substantially balances
5 the voltage imbalances between the pair of capacitors, the active element having power connections to the first and third terminals.